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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/777,608	02/11/2004	Heinrich Ollendorf	2003P54807US (BHGL 10808/	4629
757	7590	08/09/2006	EXAMINER	
BRINKS HOFER GILSON & LIONE P.O. BOX 10395 CHICAGO, IL 60610			GURLEY, LYNNE ANN	
			ART UNIT	PAPER NUMBER
			2812	

DATE MAILED: 08/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/777,608	<b>Applicant(s)</b> OLLENDORF ET AL.	
	<b>Examiner</b> Lynne A. Gurley	<b>Art Unit</b> 2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.


#### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

  
**LYNNE A. GURLEY**  
**PRIMARY PATENT EXAMINER**  
**TC 2800, AU 2812**

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

This Office Action is in response to the RCE filed 6/16/06 and the amendment filed 4/24/06.

Currently, claims 1-20 are pending.

#### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/16/06 has been entered.

#### ***Specification***

2. The disclosure is objected to because of the following informalities: On page 2, line 12, "form" should be "from". On page 2, line 13, "forma" should be "form a".

Appropriate correction is required.

3. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

#### ***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 16-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Chang et al.

(US 6,350,694, dated 2/26/02).

Chang shows the method as claimed in figures 6-7 and corresponding text, as a method of removal of chemical residues from a surface, the surface having a metal pattern 20 formed in a dielectric substrate 16/10 by a CMP process, the method comprising: plasma etching the surface to remove a thickness of the metal material corresponding to a thickness of metal residue formed in a dielectric substrate by the CMP process being substantially thinner than a thickness of the metal pattern (column 2, lines 63-67; column 3, lines 1-41 (Note that it is inherent that during the CMP process microscratches will be formed and filled with the metal residue material. See US 6,723,144 – Summary of the Invention, and US 6,395,635 – column 1, lines 50-67; column 2, lines 1-15 for support); and removing the residue in an unintended trench at the semiconductor surface. The residue comprises metal smeared in the unintended trench on the surface, the metal being smeared as an unintended result of the CMP process of the surface. The plasma etching comprises exposing the surface to plasma for a predetermined amount of time to remove a desired thickness of the metal (column 7, lines 10-30. Note that it is inherent that the plasma etch proceeds for a predetermined amount of time). The surface comprises a surface of a multilayer semiconductor device (column 2, lines 63-67). The depth of the scratch compared to the depth of the metal trench pattern is discussed (column 3, lines 1-15). The substrate is silicon. Pressures, gas flow and temperature are given (column 7, lines 30-40). Copper is exemplified for the metallization. Plasma exposure time of 10 seconds is given (column 7, line 38).

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. (US 6,350,694, dated 2/26/02) in view of Wang et al. (US 6,395,635, dated 5/28/02) and further in view of Gupta et al. (US 6,114,243, dated 9/5/00).

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10. Chang shows the method substantially as claimed as shown in the previous paragraphs.

11. Chang lacks anticipation only in not teaching that: 1) the prepared semiconductor surface is exposed to a plasma and an inert gas, the plasma having ions reacting with the metal residue to form a volatile gas; 2) the plasma comprises CF<sub>4</sub>, NF<sub>3</sub>, CHF<sub>3</sub>, C<sub>4</sub>F<sub>6</sub>, Br or Cl; and 3) the claimed ranges of pressure, gas flow rate and temperature; specifically claimed ratios for the scratch depth verses the metal pattern depth.

Wang teaches, in a similar structure where tungsten is the metal used to fill the interconnect trenches 10 and where CMP is used to planarize the structure, that the tungsten is etched to remove the metal which forms in the microscratches 40 (column 1, lines 50-67; column 2, lines 1-14; fig. 1B).

Gupta teaches that Cl or F plasma may be used to etch tungsten after a CMP process for further planarization (column 5, lines 15-20).

12. It would have been obvious to one of ordinary skill in the art to have had the prepared semiconductor surface be exposed to a plasma and an inert gas, the plasma having ions reacting with the metal residue to form a volatile gas; and the plasma comprising CF<sub>4</sub>, NF<sub>3</sub>, CHF<sub>3</sub>, C<sub>4</sub>F<sub>6</sub>, Br or Cl in the method of Chang with the motivation that if tungsten were used to fill the trenches instead of the copper, then Gupta teaches that Cl and F plasmas are conventional plasma etches for the tungsten. Additionally, Wang teaches that etching is acceptable for removing the tungsten metal in the scratches.

13. It would have been obvious to one of ordinary skill in the art to have had the claimed ranges of pressure, gas flow rate and temperature and the specifically claimed ratios for the scratch depth verses the metal pattern depth, in the method of Chang, with the motivation that the

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ranges taught in Chang are on the same order of those claimed, so that subject to routine experimentation, the claimed ranges are reasonable. Additionally, Chang teaches that the etchants and parameters are variable according to the composition of the dielectric used and the other materials being used, which one of ordinary skill in the art would also add subject to the materials used for the metal in the trench as well.

### *Conclusion*

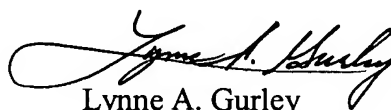
14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See the PTO 892.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynne A. Gurley whose telephone number is 571-272-1670. The examiner can normally be reached on M-F 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
Lynne A. Gurley  
Primary Patent Examiner  
Art Unit 2812

LAG  
August 7, 2006